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(72) Inventor: **Van Soest, Petrus Carolus Johannes**
1351 HC Almere (NL)

(74) Representative: **Van Breda, Jacques**
Octrooibureau Los en Stijger B.V.
P.O. Box 20052
1000 HB Amsterdam (NL)

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(71) Applicant: **Bloksma B.V.**
1332 AB Almere (NL)

(54) **Cooling apparatus for a ships motor**

(57) A cooling apparatus (3) for the cooling water of a ship's engine, comprising cooling tubes (13) through which the cooling water can be conducted, a tube plate (12) on which the cooling tubes (13) are mounted, and at the side of the tube plate (12) facing away from the cooling tubes (13) a water header (11), which water

header comprises connecting stubs (9,10) for the inlet and outlet of the cooling water, wherein a rack (15) is mounted integrated in the cooling apparatus at the nose end (14) of the cooling tubes, at a distance from the tube plate (12), comprising a cathode (16) and at least one copper anode (17,18).

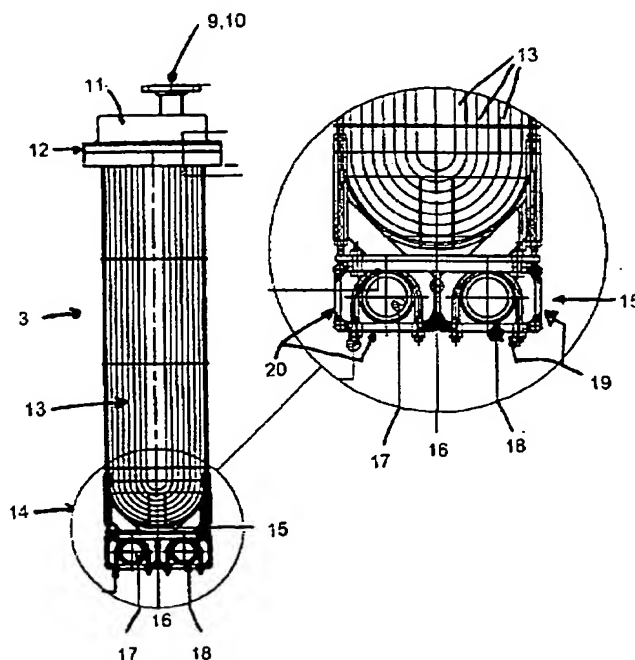


FIG. 2

Description

[0001] The invention relates to a cooling apparatus for the cooling water of a ship's engine, comprising cooling tubes through which the cooling water can be conducted, a tube plate on which the cooling tubes are mounted, and at the side of the tube plate facing away from the cooling tubes a water header, which water header comprises connecting stubs for the inlet and outlet of the cooling water.

[0002] Such a cooling apparatus is described in the not pre-published Dutch patent application NL-A-1013224 in the name of applicant.

[0003] One problem that the known cooling apparatus has had since its introduction approximately 40 years ago is fouling due to the growth of bioflora. This includes crustaceans, mussels, seaweed, algae, and the like. In order to combat this bioflora, various measures have been proposed over the years, such as chlorinating the environment in which the cooling apparatus is placed, the use of ultrasonics, but also providing a copper anode in the space where the cooling apparatus is located.

[0004] However, the problem with this is that the space in which the cooling apparatus is placed, behind the ship's hull, is limited while apart from that, placing an anode in this space involves drawbacks because the separate anode may produce mounting and leakage problems. The anode is located in the marine environment, while the anode has to be fed from the ship so that at least the feeders have to be led through the ship's wall.

[0005] It is the object of the invention to provide a cooling apparatus of the type mentioned in the preamble, wherein the problem of fouling is prevented, while avoiding the above mentioned space and leakage problems.

[0006] To this end the cooling apparatus according to the invention is characterized in that a rack is mounted integrated in the cooling apparatus at the nose end of the cooling tubes, at a distance from the tube plate, comprising a cathode and at least one copper anode.

[0007] In this way, the cathode and the copper anode afford sufficient protection when in operation against the bio fouling known from the prior art, while the cooling apparatus can be placed in the intended space of the ship as integrated apparatus without producing additional leakage risks.

[0008] In order to achieve the above-mentioned object of the invention, it is especially useful if the cooling apparatus is provided with feeders for the cathode and the at least one copper anode running between the cooling tubes and through the tube plate, wherein the same are coupled on or near the water header to connecting points for a voltage source.

[0009] In order to reduce the maintenance costs of the ship, incurred by maintenance required by the cooling apparatus, it is desirable for the same to be provided with a plurality of copper anodes, the number of which is predetermined, depending on the amperage to be fed

through the copper anodes during operation, and what a desirable life span is for the copper anodes.

[0010] It is also desirable for the rack to be embodied with pivoting arms, in order to allow the rack to be opened and closed for anode replacement. This will greatly facilitate any maintenance should this have to be carried out after all with respect to the replacement of anodes.

[0011] The invention will now be elucidated with reference to the drawing.

[0012] The drawing shows in Figure 1 a side view of a ship and in a detail of this ship, a cooling apparatus placed in the wall in accordance with the prior art.

[0013] Figure 2 shows a side view as well as a detail of the cooling apparatus according to the invention.

[0014] Identical parts in the figures carry identical reference numbers.

[0015] Referring first to Figure 1, a side view of a ship 1 is shown, and in detail a cross section of a cooling apparatus placed in the ship 1. In the ship's wall, approximately at the circle 2, a cooling apparatus 3 is accommodated. This cooling apparatus 3 is placed in a space behind the ship's hull 6, which is made watertight by means of partition plates 4 and 5. Via the openings 7 and 8 seawater can freely enter the space defined by the partition plates 4 and 5 and the ship's hull 6. The cooling apparatus 3 is provided with connecting stubs 9 and 10 for inlet or outlet, respectively, of cooling water to the ship's engine, which is not shown. These connecting stubs 9 and 10 are part of a water header 11, which connects to a tube plate 12. Mounted on this tube plate 12 are the cooling tubes 13 through which the cooling water flows that is supplied and discharged via the connecting stubs 9 and 10.

[0016] The foregoing description of the cooling apparatus according to the prior art also relates to the cooling apparatus according to the invention as illustrated in Figure 2.

[0017] Also shown in Figure 2 is a rack integrated in the cooling apparatus 3, mounted at the nose end 14 of the cooling tubes 13, that is to say at a distance from the tube plate 12, and comprising a cathode 16 and at least one copper anode 17, 18. Although Figure 2 shows two copper anodes 17, 18, at least one copper anode should be used. More than one or two copper anodes may also be used, depending on the desired maximum tool life of the cooling apparatus 3. The cathode 16 may be made from any suitable material, for example, steel.

[0018] In a manner known to the person skilled in the art, the cooling apparatus 3 may be provided with feeders connecting the cathode 16 and the copper anode 17 to a voltage source for the purpose of feeding the cathode 16 and the copper anodes 17, 18. One thing and another is preferably embodied such that said feeders extend through or between the cooling tubes 13 and through the tube plate 12, with electrical connecting points provided on or near the water head 11 for a voltage source. The person skilled in the art is quite familiar

with this so that no further explanation is required.

[0019] The rack 15 is preferably embodied with pivoting arms 19 and 20, to facilitate the replacement of copper anodes 17, 18 by a convenient opening and closing of the rack 15.

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[0020] It is remarked that the exemplary embodiment shown serves to elucidate the appended claims and is in no way intended to limit the scope of protection of said claims.

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Claims

1. A cooling apparatus (3) for the cooling water of a ship's engine, comprising cooling tubes (13) through which the cooling water can be conducted, a tube plate (12) on which the cooling tubes (13) are mounted, and at the side of the tube plate (12) facing away from the cooling tubes (13) a water header (11), which water header (11) comprises connecting stubs (9, 10) for the inlet and outlet of the cooling water, **characterized in that** a rack (15) is mounted integrated in the cooling apparatus (3) at the nose end (14) of the cooling tubes (13), at a distance from the tube plate (12), comprising a cathode (16) and at least one copper anode (17, 18).
2. A cooling apparatus according to claim 1, **characterized in that** the cooling apparatus is provided with feeders for the cathode and the at least one copper anode running between the cooling tubes (13) and through the tube plate (12), wherein the same are coupled on or near the water header (11) to connecting points for a voltage source.
3. A cooling apparatus according to claim 1 or 2, **characterized in that** the rack is embodied with pivoting arms (19, 20), in order to allow the rack to be opened and closed for anode replacement.
4. A cooling apparatus according to one of the claims 1 - 3, **characterized in that** a plurality of copper anodes is provided, the number of which is predetermined, depending on the amperage to be fed through the copper anodes during operation, and what a desirable life span is for the copper anodes.

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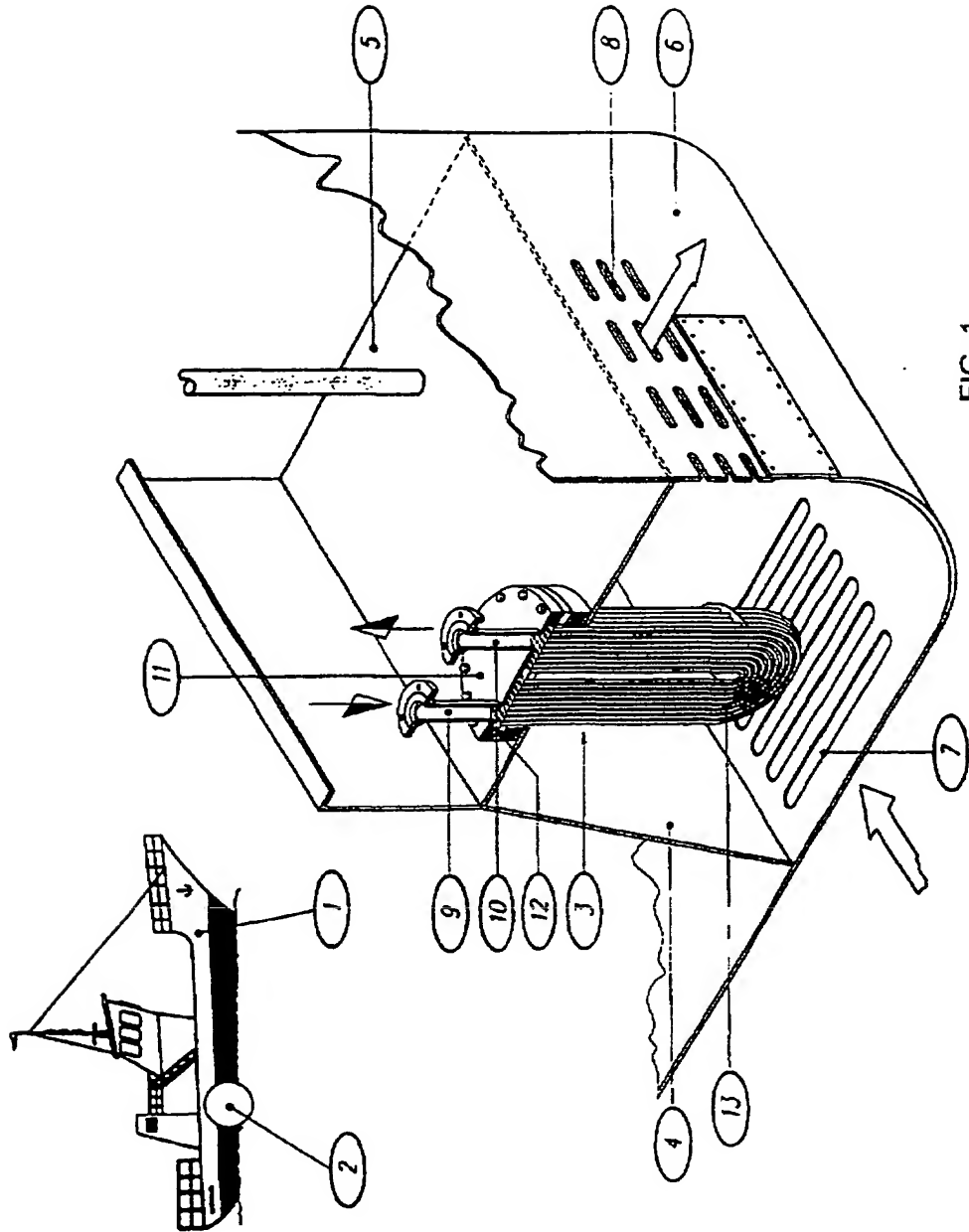


FIG. 1

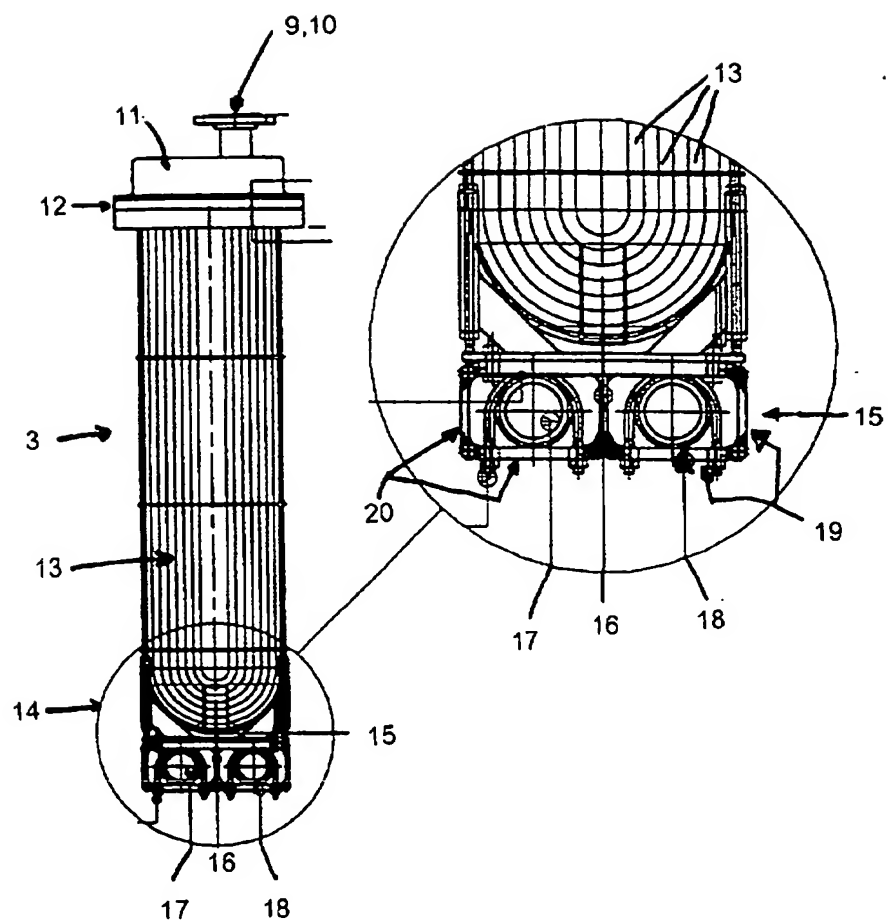


FIG. 2



European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 02 07 5644

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
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The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 3 May 2002	Examiner De Schepper, H
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

EPO FORM 1503 01 02 (P01C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 02 07 5644

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82